

# Preface

The principal editors have each been engaged in the design and construction of buildings for nanoscale science and engineering research and have noted the absence of an overarching document to guide such activity. In seeking to develop the necessary information and data that would be useful in designing and constructing buildings for such advanced technologies as nanotechnology and biotechnology, the editors convened three workshops at which architects, building contractors, environmental control specialists, and scientists engaged in these technologies were contributors. Over 300 participants attended these workshops convened from 2003 to 2006. Specialists and experts with knowledge and experience in the control of environmental disturbances to buildings and experimental apparatus contained therein contributed to these workshops and to this document. The document compiles digests of inputs from the workshops' participants with the expertise of other selected specialists and user scientists.

The design and engineering challenges identified at the workshops for nanotechnology facilities include:

- Establishing and maintaining critical environments: temperature, humidity, and pressure
- Structural vibration isolation
- Airborne vibration isolation (acoustic noise)
- Isolation of mechanical equipment-generated vibration/acoustic noise
- Cost-effective power conditioning
- Grounding facilities for low electrical interference
- Electromagnetic interference (EMI)/Radio frequency interference (RFI) isolation
- Airborne particulate contamination
- Airborne organic and chemical contamination
- Environment, safety and health (ESH) considerations
- Flexibility strategies for nanotechnology facilities

The document addresses the technology challenges unique to each of these areas and provides best practices and examples of engineering approaches to address these challenges. It presents the ideas that were generated by the various breakout groups at the workshops and supplemented by contributions from professional building design engineers and architects. The objective of the document is to provide insights on the design priorities and trade-offs for buildings to be utilized for nanotechnology, and other environmentally sensitive, research. From the time of the workshops, some changes in standards and approaches to designing and constructing buildings have occurred. Therefore, the editors have updated the recommendations, best practices, and standards to be current as of 2014.

Without the major contributions from the authors thanked in the Acknowledgements section, as well as all the other contributors and workshop participants listed in Appendix B, this identification of the challenges and compilation of information and data to guide the design and construction of buildings for advanced technologies would not have been possible. The editors extend our deep gratitude to all the contributors.

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